

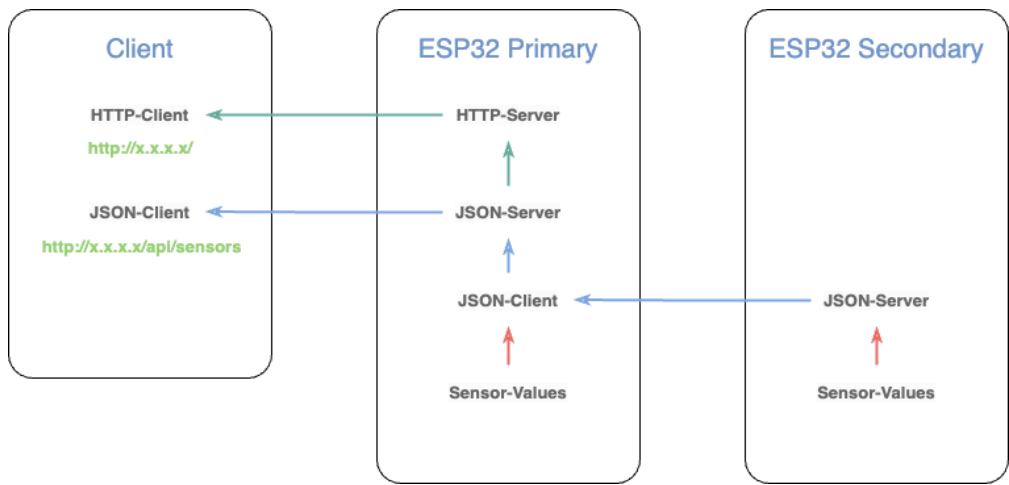
ESP32 Wetterstation

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1. Features

Server / Client structure



Webservices

ASyncWebserver	http://192.168.1.1/
Update OTA	http://192.168.1.1/update
JSON Server	http://192.168.1.1/api/sensors

Sky Quality Meter (SQM)

- Istil et al. "Night Sky Photometry with Sky Quality Meter." (2005).

see details in [How to calibrate the SQI](#)

Air Quality Index (AQI)

- <https://document.airnow.gov/technical-assistance-document-for-the-reporting-of-daily-air-quality.pdf>
- <https://www.airnow.gov/sites/default/files/2020-05/aqi-technical-assistance-document-sept2018.pdf>

PM_{2.5} / PM₁₀ (µg/m³) AQI Breakpoints

AQI Range	PM _{2.5} (µg/m³)	AQI Range	PM ₁₀ (µg/m³)
0 - 50	0.0 - 12.0	0 - 50	0 - 54
51 - 100	12.1 - 35.4	51 - 100	55 - 154
101 - 150	35.5 - 55.4	101 - 150	155 - 254
151 - 200	55.5 - 150.4	151 - 200	255 - 354
201 - 300	150.5 - 250.4	201 - 300	355 - 424
301 - 400	250.5 - 350.4	301 - 400	425 - 504
401 - 500	350.5 - 500.4	401 - 500	505 - 604

Dewpoint Calculation

- https://en.wikipedia.org/wiki/Dew_point

$$\gamma(T, \text{RH}) = \ln \left(\frac{\text{RH}}{100} \right) + \frac{bT}{c+T}$$
$$T_{\text{d}} = \frac{c \gamma(T, \text{RH})}{b - \gamma(T, \text{RH})}$$
$$b = 17.625 \quad c = 243.04^{\circ}\text{C}$$



2. Hardware

Sensors

ADS1015 (i2c)

- 4 port 12 bit AD converter

BME680 (i2c)

Enviroment sensor

- Temperature
- Humidity
- Pressure
- CO2

HM330X (i2c)

Laser dust detection sensor

- PM1
- PM25
- PM10

Davis Instruments Wind Sensor 6410 (d0, a3)

Wind direction vane, wind speed sensor

- Wind speed: Reed sensor based rotation encoder
- Wind direction: 20 kΩ potentiomete

Modern Devices Wind Sensor Ref.B (a0, a1)

Aneometer

- Wind speed
- Temperature

MLX90614 (i2c)

Infrared thermopile temperture sensor

- Ambiente temperature
- Object temperature

RG 11 (d2)

Optical Rain Gauge -> <https://rainsensors.com/products/rg-11/>

-

RS 12 (d3)

Rain sensor

-

SCD41 (i2c)

Photoacoustic NDIR senso

- CO2
- Temperature
- Humidity

TSL2591 (i2c)

High dynamic range digital light sensor

- VIS
- NIR



3. Installation

- VSCode
- PlatformIO Plugin

Modification:

After installing the libraries change in

```
.pio/build/seeed_xiao_esp32s3/ElegantOTA/src/ElegantOTA.h
```

0 to 1

```
# ifndef ELEGANTOTA_USE_ASYNC_WEBSERVER #define ELEGANTOTA_USE_ASYNC_WEBSERVER 1
# endif
```

Should be created

```
/* mysecrets.h */
#  ifndef MYSECRETS_H
#  define MYSECRETS_H

// WiFi credentials
const char *ssid = "xxx" ;
const char *password = "xxx" ;

// HTTP credentials
const char *http_username = "xxx" ;
const char *http_password = "xxx" ;

#  endif
```



4. Pinsetting



D2 -> Interrupt input (RG 11)

D3 -> Interrupt input (RS 12)

D4 -> SDA (I2C)

D5 -> SCL (I2C)

AIO -> Modern Devices temperature

AI1 →

AI2 -> Modern Devices wind sensor

AI3 -> Davis Instruments wind direction



- [Seedstudio Wiki](#)
- [Random Nerd Tutorials](#)
- [Community PlatformIO](#)

- [ElegantOTA](#)
- [ChatGPT](#)
- [Cactus.io](#) (offline)
- [INDI Library Weatherradio](#)

Special articles

- [Gauge sensors](#)



6. License

This project is licensed under the GNU General Public License v3.0 - see the [LICENSE](#) file for details.



7. Changelog

[0.2] - xxxx-xx-xx



- Updates**
- SQM
 - AQI
 - Dewpoint
 - Documentation

[0.1] - 2025-03-01



1fc1c3b

Initial Release

